



Los Alamos
NATIONAL LABORATORY
*Environmental Science and
Waste Technology*

**TECHNICAL DEMONSTRATION SUMMARY SHEET;
Vehicle and cargo inspection system (VACIS) for large crate imaging**

The Need: Los Alamos National Laboratory (LANL) is currently retrieving previously packaged oversized metal objects for processing and repackaging to meet the requirements for disposal at the LANL Solid Waste Disposal Area as low-level waste or for shipment to the Waste Isolation Pilot Plant (for disposal as transuranic waste). Contents include items such as gloveboxes, equipment and filters, which were packed in fiberglass-reinforced plywood crates. The detailed contents of each crate and their orientation within the box are not known. The vehicle and cargo inspection system (VACIS) with its highly penetrating gamma ray imaging system provides a means to non-invasively image the crate contents prior to crate disassembly. This image supports improved planning and safety for crate processing.



THE TECHNOLOGY: The VACIS unit uses a 1.6 Curie collimated source (Cesium-137) aimed at a linear detector to create an image as the unit passes by the crate. Since 1997 The United States Customs Service has used VACIS at border crossings to inspect cargo containers and trucks for contraband. In the mobile unit tested at LANL, the source and detector are mounted on a boom truck, with the source positioned in a shielded box at the end of the boom and the detector mounted on the truck. As the crate passes between the source and detector, a composite image of the contents is constructed from the linear image by the VACIS unit's on board computer.

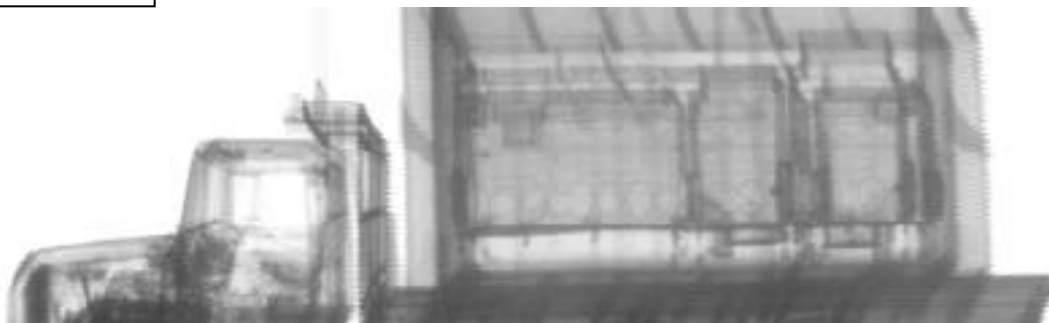
THE DEMONSTRATION: The Integrating Contractor Team of the LANL Large Scale Demonstration and Deployment Project demonstrated the mobile VACIS unit in June 1999 as part of the Large Scale Demonstration and Deployment Project. The project was funded by the U.S. Department of Energy's Deactivation and Decontamination Focus Area at the Federal Energy Technology Center. The demonstration took place at the LANL Solid Waste Operations Area. Waste containers consisting of fiber-glass reinforced plywood and standard waste boxes (SWBs) were loaded onto flatbed trucks, driven to the demonstration area and imaged using the VACIS mobile unit. Once positioned, the driver exited the truck and the VACIS unit drove along the flatbed, compiling the image. Images were reviewed in near real-time and were recorded on disk. All phases of the operation were closely monitored by LANL radiation control technicians. Personnel from the US Army's Thunder Mountain Test and Evaluation Center operated the VACIS, along with representatives from the unit's developer, Science Applications International Corporation (SAIC). The demonstration was supervised by LANL Solid Waste Operations staff.

THE RESULTS: The VACIS mobile unit provided quality images of the crate and waste container contents in which items such as glove boxes, debris inside glove boxes, equipment, tanks and filter

media were clearly visible. Once the flat bed truck was positioned, an image was obtained in less than three minutes. Images can be enhanced using a tool box of image processing tools, such as negative imaging, false color, and shading control. The demonstration met or exceeded expectations for enhanced understanding of the crate contents in support of crate opening and classification of contents. The identification and orientation of the items in the box were clearly visible, supporting quicker and safer entry into the crates. Comparison of the crate contents with the crate inventory listing also facilitates confirmation, enhancement, and correction of inventory information.

Two examples of images from the VACIS unit are presented below showing the flat bed truck and the crate for imaging. Note that the position of the source and detector also allowed perspective of the contents with respect to the crate dimensions.

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VACIS IMAGE OF GLOVEBOXES WITHIN A WASTE CRATE

LA-UR-99-3569



VACIS IMAGE OF MACHINE TOOL WITHIN A GLOVEBOX WITHIN A WASTE CRATE

Benefits:

- Provides non-invasive images of large crates
- Capable of scanning many crates per hour
- Guides opening of contaminated crates
- Provides inventory reconciliation

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